At str July 29

Friday, July 29, 2022 3:30 PM

Pg-62 Q-~~3~~, ~~13~~
Pg→63 Q→~~5~~, ~~8~~, ~~7~~
Pg→67 SecF→ ~~2~~, ~~5~~

③ $r_{n_2} - r_{n_1} = 8a_0$

$a_0 n_2^2 - a_0 n_1^2 = 8a_0$

$\boxed{n_2^2 - n_1^2 = 8}$

$7^2 - 1^2 = 8$ ✗

$3^2 - 1^2 = 8$ ✓

⑤ $\frac{(n_2-n_1)(n_2-n_1+1)}{2} = N$

$\frac{(6-1)(6-1+1)}{2} = \frac{5\times6}{2} = 15$

⑧ $2\pi r_n = n\lambda$ ~~⑦~~

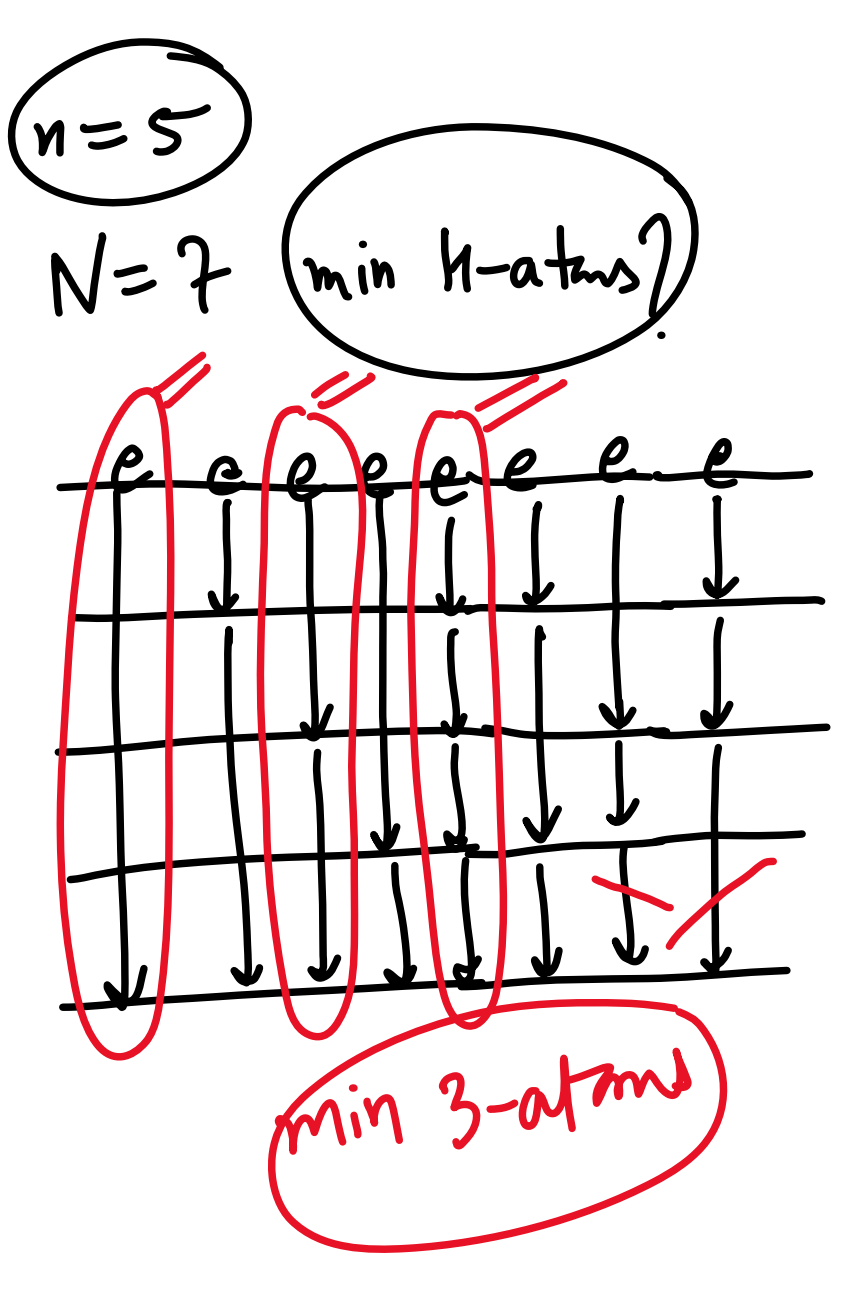
$2\times3.14\times0.529n^{\cancel{2}} = \cancel{n}\times19.92$

$n =$

~~SecF-2~~ ~~SecF-5~~

① $n=5$

$N=7$ min H-atoms?



Q→20 (Pg-23)

$A \Rightarrow (\Delta v)_A = 0.05 = \frac{1}{20}$

$B \Rightarrow (\Delta v)_B = 0.02 = \frac{2}{100} = \frac{1}{50}$

$\frac{(\Delta v)_A}{(\Delta v)_B} = \frac{5}{2}$ $\frac{\frac{1}{20}}{\frac{1}{50}}$

$m_B = 5m_A$

$\frac{(\Delta x)_A}{(\Delta x)_B}$ $\frac{(\Delta x)_A \times (\Delta v)_A = \frac{h}{4\pi m_A}}{(\Delta x)_B \times (\Delta v)_B = \frac{h}{4\pi m_B}}$

$\frac{(\Delta x)_A}{(\Delta x)_B} \times \frac{\cancel{5}}{2} = \frac{m_B}{m_A} = \cancel{5}$

# $V_3(Li^{3+}) = 2.18\times10^6 \frac{\cancel{(3)}}{\cancel{(3)}}$ m/s

$c = 3\times10^8$ m/s

$V_3(Li^{3+}) = \frac{2.18}{300} \times c$

# Ecap→1 (Q-3)

Atomic mass $= m_n \times n_n + m_p \times n_p + \cancel{m_e \times n_e} \rightarrow 0$

$= (\frac{1}{2}\text{amu}\times6) + (1\text{amu}\times6)$

$= (3+6)$ amu

$= 9$ amu

$m_n \approx m_p = 1$ amu

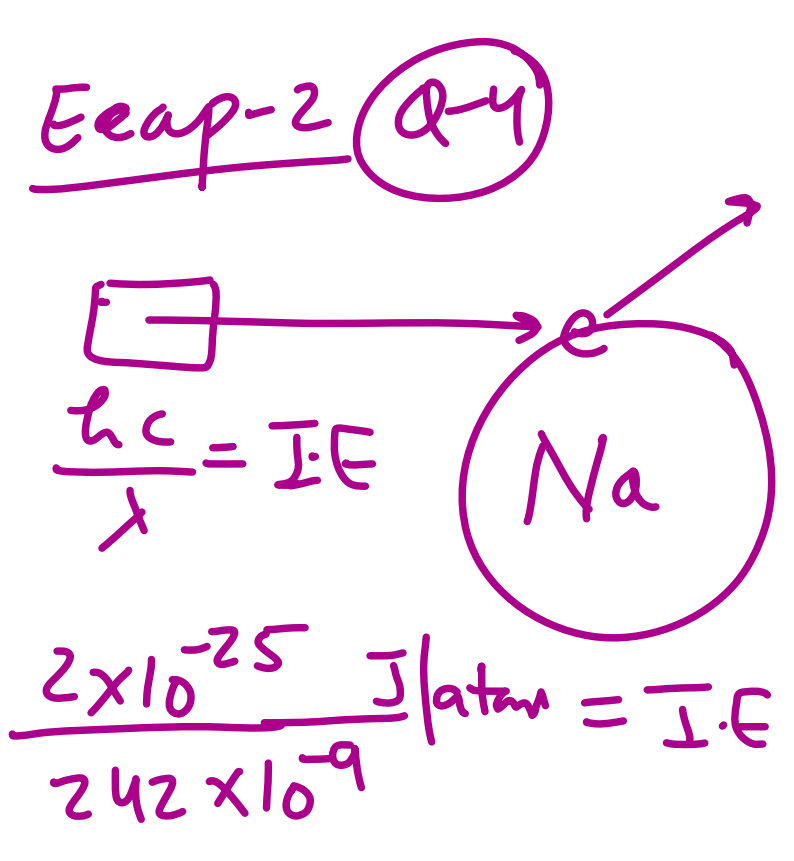
$(m_n)' = \frac{m_n}{2} = \frac{1}{2}$ amu

$m_p = 1$ amu

$m_e = \frac{1}{1837} m_p$ or m_n

$\%\text{reduced} = \frac{|12-9|}{12}\times100 = 25\%$

Eeap-2 (Q-4)



$\frac{hc}{\lambda} = I.E$

$\frac{2\times10^{-25}}{242\times10^{-9}}$ J/atom $= I.E$

$\frac{2\times10^{-25}\times N_A}{242\times10^{-9}}$ J/mole $= I.E$

$\boxed{\frac{2\times10^{-25}\times N_A}{1000\times242\times10^{-9}} \text{ KJ/mole} = I.E}$

Quantum Wave Mechanical Model (3D Model)

① This Model is based on HUP & de-Broglie Concept.

② In this Model, we talk about probability of finding e^- around the nucleus.

③ Schrödinger in 1927, described the wave like behaviour of e^- in 3D space by mathematical Eq^n.

$\boxed{\hat{H}\psi = E\psi}$ → Scrödinger Eq^n

ψ → wavefunction ⇒ Representing $\bar{e}$'s wave behaviour in orbital

or

Represents mathematically a region where $\bar{e}$ can be located with 90-95% probability & Such 3D region is called $\boxed{\text{ORBITAL}}$.

$\hat{H}$ = Total Energy operator (Hamiltonian operator)

$\hat{H} = \hat{K.E} + \hat{P.E}$

$\hat{H} = -\frac{\hbar^2}{2m_e}\nabla^2 + (V)$

$\hbar = \frac{h}{2\pi}$

$\boxed{\nabla^2 = \frac{d^2}{dx^2} + \frac{d^2}{dy^2} + \frac{d^2}{dz^2}}$

Another form of Sc. Eq^n:–

# $\frac{d^2}{dx^2}\psi + \frac{d^2}{dy^2}\psi + \frac{d^2}{dz^2}\psi + \frac{8\pi^2 m}{h^2}(E-V)\psi = 0$

or

$$\frac{\partial^2}{\partial x^2}\psi(x,y,z) + \frac{\partial^2}{\partial y^2}\psi(x,y,z) + \frac{\partial^2}{\partial z^2}\psi(x,y,z) + \frac{8\pi^2 m}{h^2}(E-V)\psi(x,y,z) = 0$$

# $|\psi|$ ⇒ Amplitude of $\bar{e}$ wavefunction.

# $\psi^2(x,y,z)$ ⇒ probability of getting $\bar{e}$ at point x,y,z in orbital.

# Each orbital contains information of maximum two electrons & both $\bar{e}$s have same Energy.

# After solving Scrödinger's wave Eq^n, we get various wavefunctions (ψ_1, ψ_2, ψ_3---) each associated with certain Energy values (E_1, E_2, E_3---).

Only those wavefunctions are valid & can represent orbitals if they satisfy certain conditions:—

① ψ must be continuous & Single Energy valued function.

② ψ must be finite.

③ $\boxed{\psi \text{ can be normalized.}}$

$$\int_{-\infty}^{+\infty} \psi^2 dV = 1$$

$dV = dx\,dy\,dz$

$\psi^2 dV$

probability of getting e^- in very small volume Element

⊛ Each wavefunction is characterised by some Nos. called Quantum Numbers. (n, l, m_l)

& Complete Wavefunction for any orbital can be written as $\psi_{n,l,m_l}(x,y,z)$ Cartesian coordinates or $\psi_{n,l,m_l}(r,\theta,\phi)$ polar coordinates

QUANTUM NO.s

① n (Principle Quantum No)

⇒ It provides information about shells or Energy levels or stationary states or orbits.

n=1, K-shell or orbit
n=2, L-shell
n=3, M-shell
n=4, N-shell
n=5, O-shell
n=6, P-shell

Max No. of $\bar{e}$s in any shell $= 2n^2$

No. of orbitals in any shell $= n^2$

Angular momentum of e^- in any shell $= \frac{nh}{2\pi}$

Shell No.	orbitals (n^2)	$\bar{e}$s ($2n^2$)
n=1 (K)	1	2
n=2 (L)	4	8
n=3 (M)	9	18
n=4 (N)	16	32
n=5 (O)	25	50
n=6 (P)	36	72

⊛ n ↑es, Energy of shell ↑es

⊛ n ↑, size of shell ↑

② l (Azimuthal Quantum No or Subsidiary Q.No.)

# It represents no. of subshells or Sub-levels in any shell.

# $\boxed{\text{Value of } l < n}$ ⇒ for any shell

# Value of subshells (l) ranges from (0 to n−1) for any shell

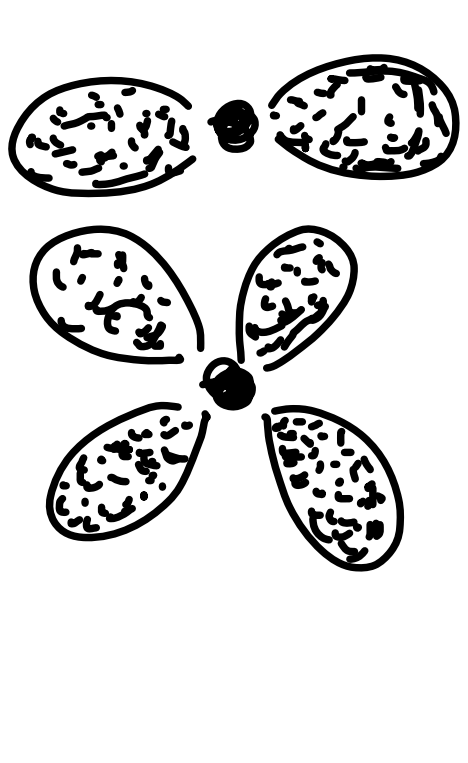
eg: (n=4) no. of subshells = shell No. = 4

l values ⇒ $\underbrace{0, 1, 2, 3}_{\text{Total of 4 values}}$

n=5	5s	5p	5d	5f	5g
n=4	l=0 (4s)	(4p) l=1	(4d) l=2	(4f) l=3	
n=3	l=0 (3s)	l=1 (3p)	l=2 (3d)		
n=2	l=0 (2s)	l=1 (2p)			
n=1	l=0 (1s)				

# Each subshell is having a shape

l=0	s-subshell	spherical shape
l=1	p-subshell	dumbell shape
l=2	d-subshell	double-dumbshell
l=3	f-subshell	Complex shape.



# A.M